

# इंटरनेट

# मानक

## Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

“जानने का अधिकार, जीने का अधिकार”

Mazdoor Kisan Shakti Sangathan

“The Right to Information, The Right to Live”

“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 7009 (1973): Optical Square (for surveying) [PGD 22: Educational Instruments and Equipment]



“ज्ञान से एक नये भारत का निर्माण”

Satyanarayan Gangaram Pitroda

“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”



BLANK PAGE



IS : 7009 - 1973

*Indian Standard*  
SPECIFICATION FOR  
OPTICAL SQUARE (FOR SURVEYING)

UDC 531.743 : 526.91



© Copyright 1973

**INDIAN STANDARDS INSTITUTION**  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 110001

Price Rs ~~3.00~~ 5.00 Gr 2

December 1973

# Indian Standard

## SPECIFICATION FOR OPTICAL SQUARE (FOR SURVEYING)

Optical and Mathematical Instruments Sectional Committee, EDC 36

*Chairman*

DR C. S. RAO

Kailas, Frenchpet, Masulipatam

### *Members*

SHRI A. ALVARES

### *Representing*

All India Instrument Manufacturers and Dealers  
Association, Bombay

SHRI V. K. VASUDEVAN (*Alternate*)

SHRI A. N. BHATTACHARYA

Ministry of Defence (R & D)

SHRI J. CHATTERJEE

Survey of India, Dehra Dun

CHIEF HYDROGRAPHER (NAVY)

Naval Headquarters

DEPUTY DIRECTOR, STANDARDS  
(TRACK)

Research, Designs and Standards Organization  
(Ministry of Railways), Lucknow

ASSISTANT DIRECTOR, STAND-

ARDS (TRACK) (*Alternate*)

DIRECTOR, INSTRUMENTS  
RESEARCH & DEVELOPMENT  
ESTABLISHMENT

Ministry of Defence (R & D)

SHRI S. S. DHARMAYYA (*Alternate*)

SHRI S. K. GAUTAM

Quality Marked Goods Manufacturers' Co-operative  
Association Ltd, Roorkee

SHRI P. L. BHARDWAJ (*Alternate*)

SHRI S. K. GHOSE

Directorate General, Ordnance Factories, Ministry  
of Defence

SHRI A. GHOSH

National Test House, Calcutta

SHRI P. C. JAIN

National Physical Laboratory (CSIR), New Delhi

SHRI RAM PRASAD (*Alternate*)

SHRI D. D. KHOSLA

Directorate of Industries, Government of Haryana,  
Chandigarh

COL K. L. KHOSLA

The Institution of Surveyors, New Delhi

COL N. P. MANAKTALA

Ministry of Defence (DGI)

LT-COL H. LAL (*Alternate*)

SHRI B. R. MANKHAND

The Koh-I-Noor (India) Private Ltd, Varanasi

DR M. V. R. K. MURTY

Department of Atomic Energy, Bombay

LT-COL B. PAPANNA

Army Headquarters

DR J. PRASAD

Central Scientific Instruments Organization (CSIR),  
Chandigarh

SHRI RAM SINGH (*Alternate*)

(Continued on page 2)

© Copyright 1973

INDIAN STANDARDS INSTITUTION

This publication is protected under the *Indian Copyright Act* (XIV of 1957) and reproduction in whole or in part by any means except with written permission of the publisher shall be deemed to be an infringement of copyright under the said Act.

(Continued from page 1)

<i>Members</i>	<i>Representing</i>
SHRI S. RAGHVIAH	Development Commissioner, Small Scale Industries, New Delhi
SHRI E. B. RAJDERKAR	Raj-Der-Kar & Co, Bombay
KUMARI SUBAS RAJDERKAR (Alternate)	Directorate General of Technical Development, New Delhi
SHRI K. N. RAMASWAMY	
SHRI P. V. MAMMEN (Alternate)	
SHRI C. NARAYANA RAO	The Andhra Scientific Co Ltd, Masulipatam
DR I. RAMAKRISHNA RAO	In personal capacity (Toshniwal Instruments and Engineering Co, 10A Najafgarh Road, New Delhi 110015)
PROF G. S. S. SARMA	Madras Institute of Technology, Madras
LT-COL G. S. SIHOTA	Directorate General of Armed Forces Medical Service, Ministry of Defence
SURVEYOR OF WORKS I [ OFFICE OF THE SUPERINTENDING SURVEYOR OF WORKS ( NDZ )]	Central Public Works Department, New Delhi
SHRI K. G. TORGAL	The National Instruments & Ophthalmic Glass Ltd, Calcutta
SHRI A. GHOSH ( Alternate )	
SHRI H. C. VERMA	Associated Instrument Manufacturers (India) Private Limited, New Delhi
SHRI K. G. PURANG ( Alternate )	
SHRI S. M. RAZVI, Head ( Mech Engg )	Director General, ISI ( Ex-officio Member )
	<i>Secretary</i>
	SHRI S. P. ABBEY
	Assistant Director ( Mech Engg ), ISI

### Surveying Instruments Subcommittee, EDC 36 : 3

<i>Convener</i>	
COL K. L. KHOSLA	The Institution of Surveyors, New Delhi
<i>Members</i>	
SHRI J. CHATTERJEE	Survey of India, Dehra Dun
CHIEF HYDROGRAPHER ( NAVY )	Naval Headquarters
SHRI N. R. DAS GUPTA	The National Instruments & Ophthalmic Glass Ltd, Calcutta
SHRI R. L. ACHARYA ( Alternate )	
SHRI H. N. DE	Ministry of Defence ( DGI )
SHRI R. C. JAIN ( Alternate )	
SHRI S. S. DHARMAYYA	Ministry of Defence ( R & D )
SHRI S. K. GAUTAM	Quality Marked Goods Manufacturers' Co-operative Association Ltd, Roorkee
SHRI JAI PRAKASH ( Alternate )	
SHRI P. C. JAIN	National Physical Laboratory ( CSIR ), New Delhi
SHRI B. R. MANKHAND	The Koh-I-Noor ( India ) Private Limited, Varanasi
DR J. PRASAD	Central Scientific Instruments Organization ( CSIR ), Chandigarh
SHRI JAGAT BHUSHAN ( Alternate )	
SHRI K. N. RAMASWAMY	Directorate General of Technical Development, New Delhi
SHRI P. V. MAMMEN ( Alternate )	
SHRI C. NARAYANA RAO	The Andhra Scientific Co Ltd, Masulipatam

# *Indian Standard*

## SPECIFICATION FOR OPTICAL SQUARE (FOR SURVEYING)

### 0. FOREWORD

**0.1** This Indian Standard was adopted by the Indian Standards Institution on 16 August 1973, after the draft finalized by the Optical and Mathematical Instruments Sectional Committee had been approved by the Mechanical Engineering Division Council.

**0.2** The optical square is a surveying instrument used for quickly setting out a line at right angles to another. It essentially consists of a pair of plane mirrors mounted at an angle of  $45^\circ$  to each other or a pentagonal prism in a mount.

---

### 1. SCOPE

**1.1** This standard covers the general and functional requirements of optical square.

### 2. TERMINOLOGY

**2.1** For the purpose of this standard, the definitions given in IS : 1399-1959\* and the following shall apply.

**2.1.1 Mount** — A (metallic) box, with openings at sides, in which the pentagonal prism or mirrors is/are placed and rigidly held.

### 3. TYPES

**3.1** The optical square shall be either mirror type (Fig. 1A and 1B) or prism type (Fig. 2).

### 4. GENERAL REQUIREMENTS

#### 4.1 Materials

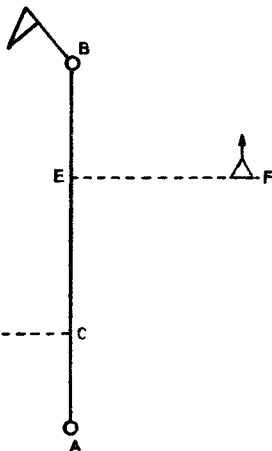
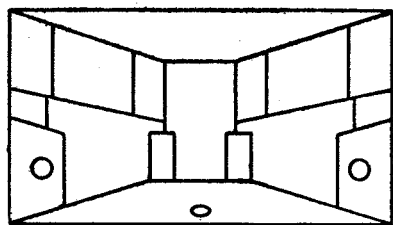
**4.1.1** The mirrors and prisms shall conform to the requirements of IS : 988-1959† and IS : 1400-1960‡.

---

\*Glossary of terms used in optical technology.

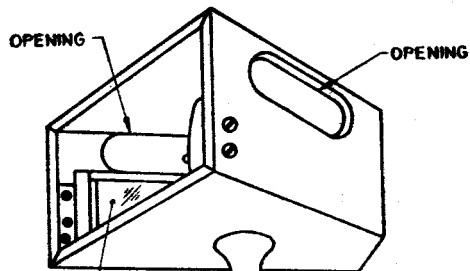
†General requirements for optical components.

‡Specification for optical glass.



(OFF SETS 'EF' AND 'CD' LAID OUT BY OPTICAL SQUARE)

1A



1B

FIG. 1 OPTICAL SQUARE, MIRROR TYPE



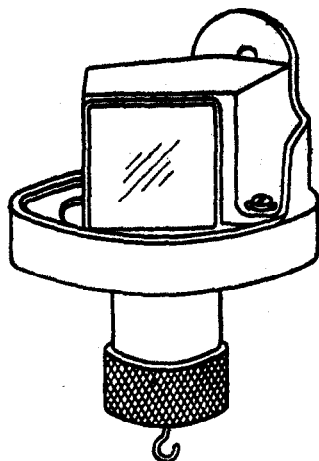


FIG. 2 OPTICAL SQUARE, PRISM TYPE

**4.1.2** The materials used for the manufacture of the mount shall be brass, aluminium or other suitable metals or alloys.

**4.2** The optical square shall have a convenient shape and size. If circular, the diameter of the mount shall be about 50 mm.

**4.3** A suitable handle shall be provided at the bottom of the mount with a hole or hook at the end of the handle for the plumb-bob, if used.

**4.4** The internal sides of the mount of the optical square shall be finished dull black.

**4.5** Arrangements shall be provided to cover the openings when not in use.

**4.6** The two mirrors in the mirror type optical square shall be placed at an angle of  $45^\circ$  with each other.

**4.7** Arrangement shall be provided to adjust the angle between the mirrors.

**4.8** The two reflecting faces of the pentagonal prism shall be silvered and suitably protected.

**4.9** A carrying case made of wood, rotproof canvas, leatherette, plastic or other suitable material as agreed to between the manufacturer and the purchaser shall be provided.

## 5. FUNCTIONAL REQUIREMENTS

**5.1** The mirrors and prism shall be held rigidly in their positions and shall not be disturbed or displaced even after slight jerks.

**5.2** The reflected image shall be free from distortion.

## 6. TESTS

**6.1** The optical square shall be initially examined for the following defects:

- a) Damage to external finish; and
- b) Scratched, broken or dirty optical surfaces.

**6.2** The quality of silvering, surface finish and durability of silvered surface shall be tested according to **4.5** and **7** of IS: 988-1959\*.

**6.3** The optical square shall be tested in the following way:

Hold the optical square at an intermediate point *O* on a straight line *AB* at both ends of which are erected two poles. Through the aperture of the optical square view the pole *A*. Erect a third pole at point *C* on a line *CO* perpendicular to *AB* and adjust the position of the pole at *C* such that its image seen through the optical square coincides with the pole *A* seen direct. Then rotate the optical square by  $180^\circ$  and view the pole *B* through the aperture. The pole *C*, seen through the optical square, should coincide with the pole *B*. Displacement, if any, between the two images represents the error in the optical square, and it shall not exceed 5 minutes.

**6.4 Heat Test** — The optical square shall be subjected to heat test in accordance with IS: 2352-1963†; the degree of severity being  $70 \pm 2^\circ\text{C}$  for 3 hours.

**6.5 Cold Test** — The optical square shall be subjected to cold test in accordance with IS: 2352-1963†; the degree of severity being  $30 \pm 3^\circ\text{C}$ .

NOTE — The heat test and cold test are recommended only for the purpose of type approval tests.

## 7. MARKING

**7.1** The optical square shall be marked at a suitable place with the manufacturer's name or trade-mark or both, its nomenclature, year of manufacture and serial number.

---

\*General requirements for optical components.

†Procedure for basic climatic and durability tests for optical instruments.

**7.1.1** The optical square may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act, and Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

## **8. PACKING**

**8.1** The optical square shall be placed in its case which shall then be suitably packed for transit.

# **INDIAN STANDARDS**

## **ON**

### **SURVEYING INSTRUMENTS**

**IS:**

- 1492-1959 Metric surveying chains
- 1632-1960 Bubbles
- 1764-1961 Trough compass
- 1779-1961 4-metre, levelling staff, folding type
- 1842-1961 Surveying chains pins (arrows)
- 1955-1961 Prismatic compass, liquid
- 1957-1961 Prismatic compasses, non-liquid
- 2288-1963 Ranging rods
- 2539-1963 Plane tables
- 2976-1964 Optical theodolite
- 2988-1965 Vernier theodolite
- 4380-1967 Abney level
- 4590-1967 Engineer's level
- 5146-1969 Sounding sextant
- 5706-1970 Spirit levels for use in precision engineering
- 5928-1970 Tangent clinometer